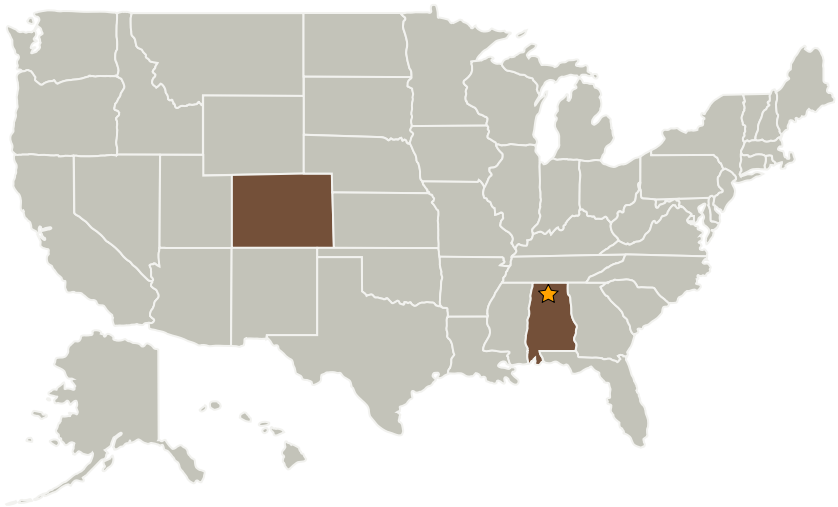
Nitrous Paraffin Hybrid, Phase I

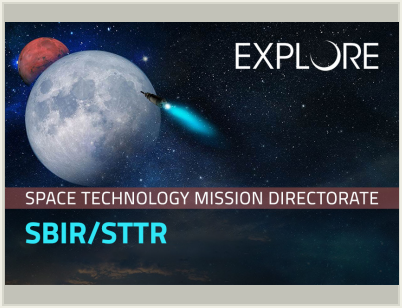
Completed Technology Project (2006 - 2006)

Project Introduction

The Nitrous Oxide Paraffin Hybrid engine (N2OP) is a proposed technology designed to provide small launch vehicles with high specific impulse, indefinitely storable propulsion. In the N2OP engine, the combination of liquid nitrous oxide on solid paraffin as a rocket propellant allows for the development of compact lightweight high performance stages using densely packed propellant tankage. This is because N2O/paraffin hybrids have a very high oxidizer/fuel mixture ratio and because paraffin has a much higher regression rate than typical hybrid hydrocarbon fuels. Propellant slumping can be prevented by molding the paraffin into a 3% by volume graphite sponge matrix. Currently, space launch missions require cryogenic or extremely toxic propellants which are limited in their storage times, reducing their capability for rapid response launch. The much more storable solid propellants have higher cost, and lower performance while still being a large explosive hazard. The N2OP propulsion system also is compatible with ocean temperatures, allowing launch by floating in water. The achievable Isp for this propellant combination using autogenous pressurization is about 235 seconds at sea level and over 310 s in vacuum, making its performance fully adequate to support operation of a safe, fully storable, highly-responsive multi-stage launch vehicle.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Pioneer Astronautics	Supporting Organization	Industry Historically Underutilized Business Zones (HUBZones)	Lakewood, Colorado

Primary U.S. Work Locations	
Alabama	Colorado

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.5 Hybrids